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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary**Application No.**

10/509,665

Applicant(s)ADAMENKO, STANISLAV
VASILYEVICH**Examiner**

VADIM DUDNIKOV

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 16 November 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 23-41, 43, 46 and 47 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 23-41, 43, 46 and 47 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 27 September 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date 11/16/07.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____.
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Information Disclosure Statement

1. The information disclosure statement filed 11/16/2007 fails to comply with the provisions of 37 CFR 1.97, 1.98 and MPEP § 609 because the IDS information of items 1, 3, 4, 5 and 6 lacks all source, author(s), page(s) info. It has been placed in the application file, but the information referred to therein has not been considered as to the merits. Applicant is advised that the date of any re-submission of any item of information contained in this information disclosure statement or the submission of any missing element(s) will be the date of submission for purposes of determining compliance with the requirements based on the time of filing the statement, including all certification requirements for statements under 37 CFR 1.97(e). See MPEP § 609.05(a).

The information disclosure statements filed 11/16/2007 and all other information or that portion which caused it to be listed has been placed in the application file, the information has been considered.

Response to Amendment

2. Amendment filed 11/16/2007 forms the basis for this Office Action.

Abstract, Specification, claims 23, 27, 31, 34 and 38-39 have been amended. Claims 42 and 44-45 have been canceled. Claims 23-41, 43 and 46-47 have been pending.

Those rejections and objections that have been overcome by amendment are omitted from the present Office action and are considered withdrawn.

Objection of Abstract and Drawings have been withdrawn.

3. The amendment filed 11/16/2007 is objected to under 35 U.S.C. 132(a) because it introduces new matter into the disclosure. 35 U.S.C. 132(a) states that no amendment shall introduce new matter into the disclosure of the invention. The added material which is not supported by the original disclosure is as follows: Specification amendments change significantly a scope of invention and introduce a new matter by removing disclosure relating to the Inertial Confinement Fusion (ICF).

Applicant is required to cancel the new matter in the reply to this Office Action.

Response to Arguments

4. Applicant's arguments and remarks see pages 19-33, filed on 11/16/2007 with respect to of said previous Office action and other documents have been fully considered but they are persuasive in not all aspects.

The amendments of Abstract, specification and to claims 23, 27, 31, 34 and 38-39, cancelling of claims 42 and 44-45 are acknowledged.

Those objections and rejections that have been overcome by amendment are omitted from the present Office Action and are to be considered withdrawn.

Applicant's Arguments on pages 20-22 regarding a Specification objection and experimental condition limitation in Zelenskii publication are not persuasive because after Zelenskii publication a tremendous number of similar experiments were carried out (available now through the Internet) with rod anode compression by an electron beam impact in RVD with overlapping of Applicant's experimental conditions. (See for example Fortov, "Nonideal plasma under extreme conditions generated by shock waves", Plasma Phys. Control. Fusion 45, A1-A16, 2003); Mahaffey et al., "Intense electron-beam pinch formation and propagation in rod pinch diode", Appl. Phys. Letter. 33(9), 795-797, 1978). In said experiments similar damages of anode rod ends were observed as disclosed in the Application but no unknown chemical elements or isotopes or any other products of any pycnonuclear processes were ever observed. A pressure up to 150 Mbar (higher than in a sun center) was reached in shock waves generating by thermonuclear explosion but no unknown chemical elements or isotopes or any other products of any pycnonuclear processes were ever observed (See Fortov).

A support of realization of the unknown pycnonuclear processes and unknown chemical elements including stable transuranides by Appendixes 1-14 is not persuasive because there are no a reliable and credible conformations of elements identification with acceptable accuracy in the same sample by different method or by different team. It is noted, that incorrect element identification is a typical and frequent problem in the field of transmutation, demonstrated many times including a non-discovery of a nuclear

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fission by Fermi and Curie and modern problem with transuranides identification generating in "normal" nuclear reactions (see for example "Enrico Fermi", page 3, lines 40+).

Applicant's arguments relating to traverse of the claims 23-41 rejection under 35 U.S.C. 102 (b) are not persuasive because in the claim rejection columns and lines of the text are presented with disclosure of claim limitations by the prior art, that meets the applicant's claim limitation (according to the broadest reasonable interpretation). Applicant fails to specifically address the limitations as rejected, with requirements based on the actual claim language. Applicant's disclosure in the specification of unknown isotopes and stable transuranides production in said pycnonuclear processes is contradicted by modern nuclear physics and is not supported any credible experiments.

Applicant's arguments relating to traverse of the claims 42-47 rejection under 35 U.S.C. 103 are not persuasive because in the claim rejection columns and lines are presented to prior art with disclosure of claim limitations in the prior art, meeting an obviousness of the applicant's claim limitation in view of prior art combination (at list in the broadest reasonable interpretation).

Applicant's claim limitations have no patentable differences relative to the prior art. Rejections of amended claims are established in light of further consideration and search of the prior Art. See rejections underneath. Accordingly, there are no reasons for allowance of the rejected claims.

Specification

5. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

6. The specification is objected to under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. As stated in MPEP § 2164.03, the amount of guidance or direction needed to enable the invention is inversely related to the amount of knowledge in the state of the art as well as the predictability in the art. In *re Fisher*, 427 F2d 833, 839, 166 USPQ 18, 24 (CCPA 1970). Other factors contributing to lack of enablement may include the breadth of the claims, the nature of the invention, the existence of working examples and the quantity of experimentation needed to make or use the invention based on the content of the disclosure (see MPEP § 264.01(a)).

The art of the present invention (i.e., to compress a substantial portion of the target substance to a **superdense** state", ("a **superdense** state in which pycnonuclear processes and inertial confinement **fusion** (ICF hereafter) may proceed...", "at which

state a substantial portion of the target substance transforms into **electron-nuclear** and **electron-nucleonic plasma**") is so new and in initial stage of development that it cannot be considered to have a body of knowledge associated with it, much less predictability of results.

Applicant has not provided well established data regarding the invention utility supporting applicant's claims: "[0004] This technology is intended practically for **transmutation** of atomic nuclei of certain chemical elements into nuclei of other chemical elements with the purpose of:; [0005] Experimentally obtaining preferably stable isotopes of chemical elements including synthesis of **stable transuranides**; [0006] **Reprocessing radioactive waste** containing long-lived isotopes into materials containing short-lived isotopes and/or stable isotopes, which is particularly important in decontamination of used gamma-ray sources, e.g., based on radioactive isotopes of cobalt widely used in industry and medicine. [0007] In future, this method may be useful for obtaining energy by the ICF with utilization of preferably solid target".

These capabilities of the claims are not verified by independent experiments, but rather has only presented applicant's results with some speculations and assumptions. Since Applicant has not well established the operability of the presently claimed invention, it is considered that the invention is lacking in utility.

Given the state of the art as discussed herein, it is unreasonable to expect one skilled in the art to be able to make and use the claimed invention without undue experimentation (See also Response to Arguments).

The claimed invention as a whole must be **useful** and accomplish a **practical** application. That is, it must produce a "useful, concrete and tangible result." The purpose of this requirement to limit patent protection to inventions that possess a certain level of "real world" value, as **opposed to subject matter that represents nothing more than an idea or concept, or is simply a starting point for future investigation or research.**

2164.01(a) Undue Experimentation Factors

There are many factors to be considered when determining whether there is sufficient evidence to support a determination that a disclosure does not satisfy the enablement requirement and whether any necessary experimentation is "undue." These factors include, but are not limited to:

(A) The breadth of the claims- *is doubtful, because the invention alleges to solve a "nuclear transmutation problem, **stable transuranide** production and energy production through a "**pycnonuclear process**". ("Pycnonuclear process" is such a recombinational interaction ('cold' in particular) between components of electron-nuclear and electron-nucleonic plasma of the target substance compressed to a superdense state causing at least the target isotopic composition change); and hence applicant's claimed invention spans both fundamental physics at a non-established stage and the application thereof thus being non credible*

(Fortov, "Nonideal plasma under extreme conditions generated by shock waves", Plasma Phys. Control. Fusion., 45, A1-A16, 2003; Mahaffey et al., "Intense electron-beam pinch formation and propagation in rod pinch diode", Appl. Phys. Letter. 33(9), 795-797, 1978); K. Zelenskii et al., "Effects of electron impact on the anode of pulsed X-ray tube", Sov. Phys.-Tech. Phys., v.13, No 9, 1284-1289, 1969);

(B) The nature of the invention- *there is an apparatus and method for nuclear transmutation, **stable transuranide** production and energy production through "pyncnonuclear process"; the nature of the invention as disclosed thus involves very drastic change of hypotheses in the nuclear physics* (Fortov, "Nonideal plasma under extreme conditions generated by shock waves", Plasma Phys. Control. Fusion 45, A1-A16, 2003; Mahaffey et al., "Intense electron-beam pinch formation and propagation in rod pinch diode", Appl. Phys. Letter. 33(9), 795-797, 1978); K. Zelenskii et al., "Effects of electron impact on the anode of pulsed X-ray tube", Sov. Phys.-Tech. Phys., v.13, No 9, 1284-1289, 1969);

(C) The state of the prior art- *effects claimed by applicant's were not observed in many experiments with near similar condition of rod-pinch anode irradiation by relativistic electrons* (Fortov, "Nonideal plasma under extreme conditions generated by shock waves", Plasma Phys. Control. Fusion 45, A1-A16, 2003; Mahaffey et al., "Intense electron-beam pinch

formation and propagation in rod pinch diode", Appl. Phys. Letter. 33(9), 795-797, 1978; K. Zelenskii et al., "Effects of electron impact on the anode of pulsed X-ray tube", Sov. Phys.-Tech. Phys., v.13, No 9, 1284-1289, 1969);

(D) The level of one of ordinary skill- *there is no experience for production for anomaly nuclear transmutation, **stable transuranide** production and energy production through "**pycnonuclear process*** Fortov, "Nonideal plasma under extreme conditions generated by shock waves", Plasma Phys. Control. Fusion 45, A1-A16, 2003; Mahaffey et al., "Intense electron-beam pinch formation and propagation in rod pinch diode", Appl. Phys. Letter. 33(9), 795-797, 1978; K. Zelenskii et al., "Effects of electron impact on the anode of pulsed X-ray tube", Sov. Phys.-Tech. Phys., v.13, No 9, 1284-1289, 1969);

(E) The level of predictability in the art- *a possibility for nuclear transmutation, stable transuranide production and energy production through "**pycnonuclear process**" and the target isotopic composition change as claimed are likely impossible* (;Fortov, "Nonideal plasma under extreme conditions generated by shock waves", Plasma Phys. Control. Fusion 45, A1-A16, 2003; Mahaffey et al., "Intense electron-beam pinch formation and propagation in rod pinch diode", Appl. Phys. Letter. 33(9),

795-797, 1978); K. Zelenskii et al., "Effects of electron impact on the anode of pulsed X-ray tube", Sov. Phys.-Tech. Phys., v.13, No 9, 1284-1289, 1969);

(F) The amount of direction provided by the inventor- *is wholly insufficient because, inventor presented assumptions, speculations related to stable transuranides are not conformed in independent experiments.*

G) The existence of working examples- **example exist but realization of "pycnonuclear process"** determined by applicant as a such *recombinational interaction ('cold' in particular) between components of electron-nuclear and electron-nucleonic plasma of the target substance compressed to a superdense state causing at least the target isotopic composition change does not have a credible independent confirmations.*

(H) **The quantity of experimentation needed to make or use the invention based on the content of the disclosure- need undue experimentation and can have likely negative and unpredictable results.**

Claim Objections

7. Claim 23 is objected to because of the following informality:

In claim 1, in line 16 replace —axes— to —axis— after “the”; in line 11 replace --“the perimeter of the rear end”— by --“a perimeter of a rear end”—; in line 12 replace --“as the whole”— by --“as a whole”—; in line 12 replace --“the axes of symmetry”— by “axes of symmetry”—; in line 19 replace --“axial gap”— by --“gap towards the plasma cathode”—; in line 15 replace —said cathode— after “placing” by —said plasma cathode—; in line 16 replace —this—after “of” by —the—; in line 19 replace —this—after “and” by —the—. Appropriate corrections are required.

Claim Rejections - 35 USC § 112

8. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

9. Claim 23-30 rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Limitation of the claim 23: “an axisymmetric detail” (line 5; new matter) is not supported by the Specification.

10. Plasma cathode is only disclosed as being produced once, not twice as now recited by amendment; the "emitting area" of the plasma cathode has never been identified and is not inherent in the structure, if only because said area depends on the electric field distribution and strength around the cathode, while said cathode as a whole is complicated in spatial structure.

11. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

12. Claims 23-30 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The claim 23 recites the limitation "practically coincident" in the lines 16-17. Term ""practically" is relative and indefinite because does not determined precisely an accuracy of "coincidence" essential for claimed invention.

Limitation of the claim 23: "an axisymmetric detail" (line 5; new matter) is not supported by the Specification.

Plasma cathode is only disclosed as being produced once, not twice as now recited by amendment; the "emitting area" of the plasma cathode has never been identified and is not inherent in the structure, if only because said area depends on the electric field distribution and strength around the cathode, while said cathode as a whole is complicated in spatial structure.

Claim Rejections - 35 USC § 102

13. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

14. Claims **23 and 25-30** are rejected under 35 U.S.C. 102(b) as being anticipated by Mahaffey, (U.S. Patent # 4,213,073; Mahaffey1 hereafter, cited before) or Mahaffey et al., ("Intense electron-beam pinch formation and propagation in rod pinch diode", Appl. Phys. Letter. 33(9), 795-797, 1978; Mahaffey2 hereafter) separately.

As best as can be understood because of the indefiniteness as discussed above, on independent claim **23**, Mahaffey1 discloses: A method of compressing a substance by impact utilizing a relativistic vacuum diode (column 1, lines 5, column 3, lines 28+) having an axisymmetric vacuum chamber with current-conducting walls (18 in Fig. 3, column 3, lines 18+), an axisymmetric plasma cathode (10 in Fig. 3, column 3, lines 18+) and an axisymmetric anode-enhancer (14 in Fig. 3, column 3, lines 18+) including: producing a target in the shape of an axisymmetric detail made of a condensed substance that functions as at least a part of the anode-enhancer ("suitable target" consisting of different material, not shown, column 4, lines 15+), producing a plasma cathode in the form of a rigidly assembled current-conducting rod and a

dielectric end element (bore 12 is dielectric; meets claim language), with an emitting area which exceeds a cross-section area of the current-conducting rod and a maximal cross-section of the anode-enhancer, producing a plasma cathode in the form of a current-conducting rod comprising a dielectric end element ("bore" 12 is a dielectric; column 1, lines 19, column 2, lines 42+, column 3, lines 1+) having the perimeter (bore 12) of the rear end embracing the perimeter of said rod at least in the plane perpendicular to the axis of symmetry of the cathode as the whole (column 2, lines 60+), and the area of the emitting surface being greater than the maximum cross-section area of the anode enhancer, placing said cathode inside the vacuum chamber (18 in FIG. 3) of the relativistic vacuum diode in such position that the axes of symmetry of this cathode and this vacuum chamber practically coincide (as shown in Fig. 3, column 3, lines 18+), placing the anode-enhancer in the vacuum chamber of the relativistic vacuum diode practically on the same geometric axis with the plasma cathode with such an axial gap that the center of curvature of the working surface of the anode-enhancer is located inside the focal space of the collectively self-focusing electron beam (anode 14 is capable to move along the axis and capable to move into said position), pulse discharge of a high-voltage power source via the relativistic vacuum diode to generate an electron beam with an electron energy not smaller than 0.2 MeV (column 3, lines 27+) , and acting upon the surface of the anode-enhancer by said beam in an electron collectively self-focusing mode (column 4, lines 15+) with the current density not smaller than 10^6 A/cm² and pulse duration not greater than 100 ns (column 3, lines 27+).

References to the prior art meet all claim limitation. Mahaffey¹ also discloses all

limitations of claim 23.

On claim **25**, Mahaffey1 discloses: the target is formed in the shape of an insert into the central part of the RVD anode-enhancer (column 4, lines 15-29), the diameter of said insert is chosen in the range of 0.05 to 0.2 of the maximum cross-sectional dimension (d_{\max}) of the anode-enhancer (column 4, lines 15-29).

On claim **26**, Mahaffey1 discloses: at least that part of the anode-enhancer, which is directed to the plasma cathode, is spheroidally formed prior to mounting in the relativistic vacuum diode (column 4, lines 57+, column 5, lines 1+).

On claim **27**, Mahaffey1 discloses: the target is formed in the shape of a spheroidal body tightly fixed inside the anode-enhancer in such a way that the centers of the inner and outer spheroids practically coincide (column 4, lines 57-62, column 5, lines 1+).

On claim **28**, Mahaffey1 discloses: the anode-enhancer surface is acted upon by an electron beam having the electron energy up to 1.5 MeV, current density not greater than 10^8 A/cm² and duration not greater than 50 ns (column 3, lines 24-39).

On claim **29**, Mahaffey1 discloses: the current density of the electron beam is not greater than 10^7 A/cm². (column 3, lines 24-39).

On claim **30**, Mahaffey¹ discloses: the residual pressure in the vacuum chamber of the relativistic vacuum diode is maintained at the level not greater than 0.1 Pa (column 3, lines 18-20).

Claim Rejections - 35 USC § 103

15. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

16. Claims **31-41 and 24** are rejected under 35 U.S.C. 103(a) as being obvious over Mahaffey (U.S. Patent # 4,213,073; Mahaffey¹ hereafter; cited before) in view of Bykov et al., "Development of Long-lifetime Cold Cathodes", Technical Physics Letters, v. 25, (11), 71-74, 1999, (Bykov hereafter; cited before).

As best as can be understood because of the indefiniteness as discussed above, on claim **31**, Mahaffey¹ discloses: A device for impact compression of a substance, which is based on relativistic vacuum diode and is comprised of: a strong gas-tight housing (18 in Fig. 3, column 3, lines 18+) a part of which is made of a current-conducting material shaped in axial symmetry to confine a vacuum chamber, and an axisymmetric plasma cathode (20 in Fig. 3, column 3, lines 18-39) with an emitting area

which exceeds a maximal cross-section of an axisymmetric anode-enhancer, the axisymmetric anode-enhancer at least a part of which is designed to be a target (column 4, lines 15-29, lines 53-63) for impact compression, said anode-enhancer having the maximum cross-section area smaller than the area of the emitting surface of said cathode and being mounted in said vacuum chamber with an axial gap practically on the same geometric axis of with said cathode, and a pulsed high-voltage power source connected at least to said plasma cathode (column 4, lines 63-68), at least one of said relativistic vacuum diode electrodes being provided with means for adjusting the gap between the electrodes (column 3, lines 1-39), and the distance from the common geometric axis of said electrodes to the inner side of the current-conducting wall of said vacuum chamber being greater than $50 d_{\max}$ (column 3, lines 18-39), where d_{\max} is a maximum cross-sectional dimension of the said anode-enhancer.

Mahaffey1 does not necessarily teach exactly the limitation "an axisymmetric plasma cathode in the form of a rigidly assembled current-conducting rod and a dielectric end element with an emitting area which exceeds a cross-section area of the current-conducting rod".

However, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to include said limitation in view of Bykov, drawn to the relativistic electron beam generation, hence analogous art who teach: composition cathodes with the dielectric surface (as shown in Fig. 1(a), page 73, lines 32+, page 74, lines 1+), which meet claim limitation. Claim limitation is obvious because use of known technique to improve similar devices in the same way.

Motivation for said inclusion derives from Bykov: "To increase the lifetime of cold cathodes, (page 73, lines 32-33)".

On claim **32**, Bykov discloses: the current-conducting rod of said plasma cathode is pointed and the dielectric end element thereof is provided with an opening for setting on said rod the setting part of which is located inside said opening together with the pointed end (as shown in Fig. 1 (a), page 72 lines 5+; page 73, lines 32+, page 74, lines 1+).

Motivation for said inclusion derives from Bykov: "To increase the lifetime of cold cathodes, page 73, lines 32-33)".

Claim limitation is obvious as use of known technique to improve similar device in the same way.

On claim **33**, Mahaffey¹ discloses: said anode-enhancer has a circular shape in the cross section and is completely produced of a material to be transmuted that is current-conducting in its main mass (column 3, lines 18-39, column 4, lines 15-29).

On claim **34**, Mahaffey¹ discloses: said anode-enhancer is made composite and comprises at least a one-layer solid shell and an inserted target tightly embraced by this shell, said target being in the shape of a body of revolution and made of an arbitrary condensed material with a diameter within the range of $(0.05-0.2) d_{\max}$, where d_{\max} is a maximum cross-sectional dimension of the anode-enhancer (column 4, lines 15-29,

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lines 57-62).

On claim **35**, Mahaffey1 discloses: at least one shield preferably of current-conducting material is mounted in the tail part of said anode-enhancer (column 2, lines 62-68, column 5, lines 1-6).

On claim **36**, Mahaffey1 discloses: said shield is a thin-wall body of revolution with the diameter not less than $5d_{max}$ which is spaced from the nearest to the plasma cathode end of said anode-enhancer by the distance up to $20d_{max}$, where d_{max} is a maximum cross-sectional dimension of the anode-enhancer (column 2, lines 62-68, column 5, lines 1-6).

On claim **37**, Mahaffey1 discloses: A device as defined in claim 36, wherein said thin-wall body of revolution has a flat or concave surface at the side of said anode-enhancer(column 2, lines 62-68, column 5, lines 1-6).

As best as can be understood because of the indefiniteness as discussed above, on claim **38**, Bykov discloses: An axisymmetric plasma cathode for the relativistic vacuum diode having a current-conductive rod for connection to a pulsed high-voltage power source and a dielectric end element (as shown in Fig. 1(a), page 73, lines 32+, page 74, lines 1+), the perimeter of the rear end of said dielectric element

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embraces the perimeter of said rod at least in the plane perpendicular to the axis of symmetry of the cathode (as shown in Fig. 1(a), page 73, lines 32+, page 74, lines 1+)).

On claim **39**, Bykov discloses: A cathode as defined in claim 38, wherein said current-conducting rod is pointed and said dielectric end element is provided with an opening for setting on said rod the setting part of which is located together with the pointed end inside the said opening (as shown in Fig. 1(a), page 73, lines 32+, page 74, lines 1+).

Motivation for said inclusion derives from Bykov: "To increase the lifetime of cold cathodes, page 73, lines 32-33)".

On claim **40**, Bykov discloses: said dielectric end element has a blind opening (as shown in Fig. 1(a), page 73, lines 32+, page 74, lines 1+).

Motivation for said inclusion derives from Bykov: "To increase the lifetime of cold cathodes, page 73, lines 32-33)".

Claim limitation is obvious as use of known technique to improve similar device in the same way.

On claim **41**, Bykov discloses: A cathode as defined in claim 39, wherein said dielectric end element has a through opening (as shown in Fig. 1(a), page 73, lines 32+, page 74, lines 1+)

Motivation for said inclusion derives from Bykov: "To increase the lifetime of cold cathodes, page 73, lines 32-33)".

On claim **43**, Bykov discloses: said dielectric end element has a developed surface; cathode with dielectric end element having a developed surface (Fig. 5, page 74, lines 2-6).

Motivation for said inclusion derives from Bykov: "To increase the lifetime of cold cathodes, page 73, lines 32-33)".

Claim limitation is obvious as use of known technique to improve similar device in the same way.

On claim **24**, Bykov discloses: plasma cathode has a pointed current-conducting rod, the dielectric end element of this cathode is provided with an opening for setting on said rod, and the setting part of said rod together with the pointed end is located inside the opening (as shown in Fig. 1(a), page 73, lines 32+, page 74, lines 1+).

Motivation for said inclusion derives from Bykov: "To increase the lifetime of cold cathodes, page 73, lines 32-33)".

Claim limitation is obvious as use of known technique to improve similar device in the same way.

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17. Claims **46-47** are rejected under 35 U.S.C. 103(a) as being obvious over Mahaffey (U.S. Patent # 4,213,073; Mahaffey1 hereafter) in view of Bykov et al., "Development of Long-lifetime Cold Cathodes", Technical Physics Letters, v. 25, (11), 71-74, 1999, (Bykov hereafter) and further in view of Korenev (Patent SU No. 1545826, Korenev, hereafter; cited before).

On claim **46** and **47**, Mahaffey1 and Bykov disclose all limitation of claims 38 and 39 as detailed above.

Mahaffey1 and Bykov do not necessarily teach exactly the limitation "said minimum cross-sectional dimension of said dielectric element is $C_{de\ min} = (5-10) C_{cr\ max}$, and the length of said element is $l_{de} = (10-20) C_{cr\ max}$, where $C_{cr\ max}$ is a maximum cross-sectional dimension of the current-conducting rod.

However, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to include said limitation in view of Korenev, drawn to the relativistic electron beam generation and material processing by electron beam, hence analogous art who teach this limitation (Abstract, Fig. 1, page 1, lines 15-23, page 2, lines 17-31). Reference to prior art meets claim limitation. Exact size of elements is an object of design and optimization with using a routine experimentation and cannot be a subject of claim limitation. Claim limitation is obvious as use of known technique to improve similar devices in the same way.

Motivation for said inclusion derives from Korenev: "For improve a functional possibilities of electron beam generation (Abstract, page 1, lines 14-15)".

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Claim limitation is obvious as use of known technique to improve similar device in the same way.

Conclusion

18. Applicant's amendment filed at 3/30/2007 necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

19. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Vadim Dudnikov whose telephone number is 571- 270-1325. The examiner can normally be reached on 8:00 - 17:00.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jack W. Keith can be reached, Mon-Fri 7:00am-4:00 pm, at telephone number 571-272-6878. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

20. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Patent Examiner.

Vadim Dudnikov

February 5, 2008.

/Johannes P Mondt/

Primary Examiner, Art Unit 3663